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(71) Applicants American Can Company, American Lane, Greenwich, Connecticut 06830, United States of America.
(72) Inventors Keith Duane Lind, Deane Edward Galloway.
(74) Agents Graham Watt & Co., Riverhead, Sevenoaks, Kent TN13 2BN.

(54) Heat-sealable bags

(57) A heat sealable bag (10) for vacuum packaging meat has two outer panels (11, 12) and an inner panel (13) which serves as a cushion to protect the bag (10) from puncturing by sharp bones which may protrude from the meat. The inner panel (13) has external surfaces of heat sealable plastics material which may enclose a foamed plastics layer, while the outer panels (11, 12) have inwardly-facing surfaces of heat sealable plastics material and outwardly-facing surfaces of plastics material which are unaffected by temperatures used to effect heat sealing. The inner panel (13) covers at least 50% of the bag inner surface and is heat sealed between the outer panels (11,12) along the two sides 14, 15 and rear (16) of the bag. After filling the bag (10), the three panels (11, 12, 13) are sealed face to face along their front edges (17, 18, 19) to close the bag.

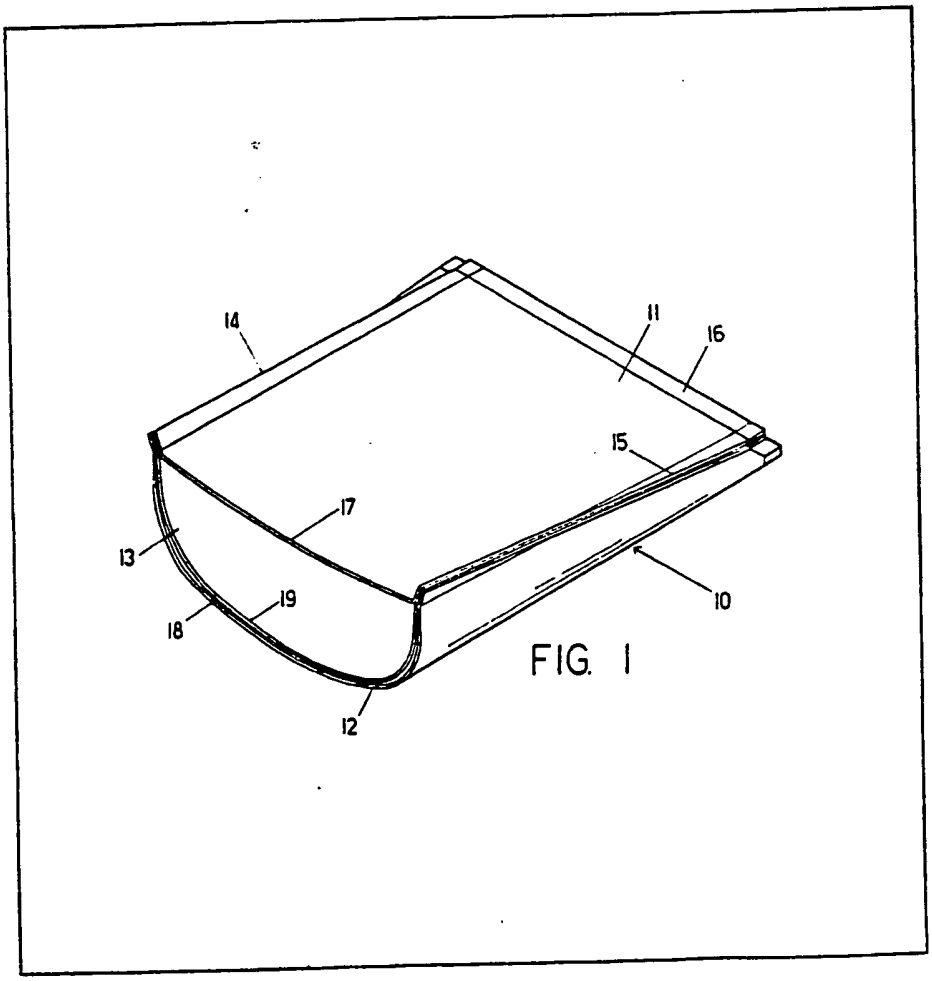

FIG. 1

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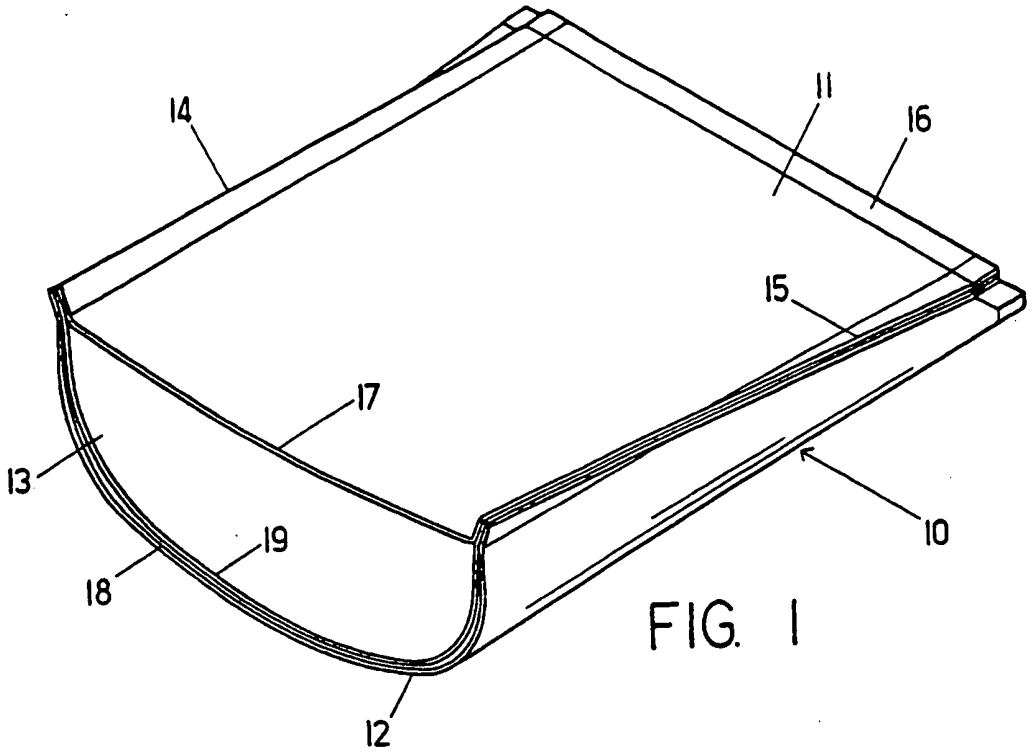

FIG. 1

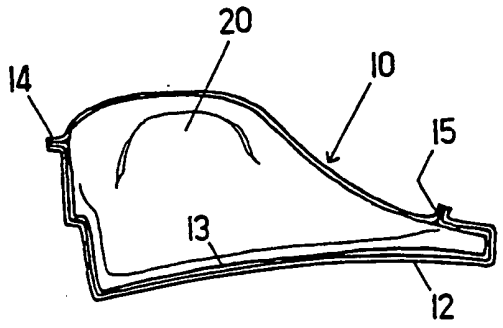

FIG. 2

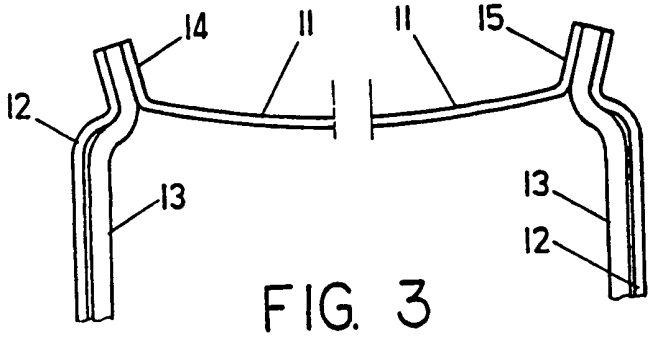

FIG. 3

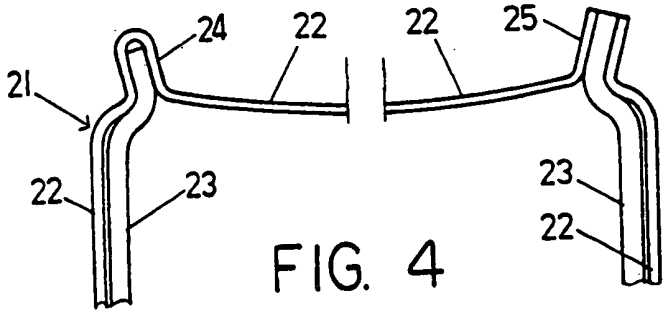

FIG. 4

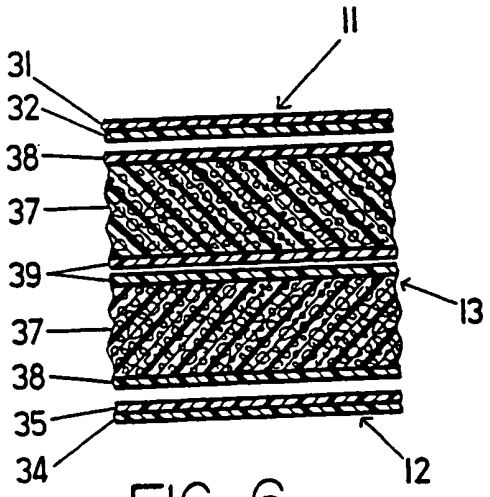

FIG. 6

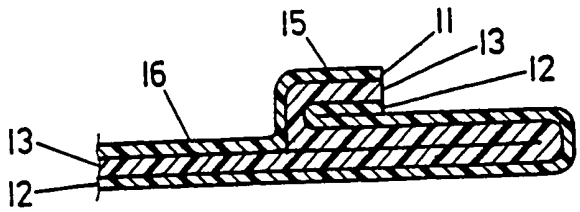

FIG. 5

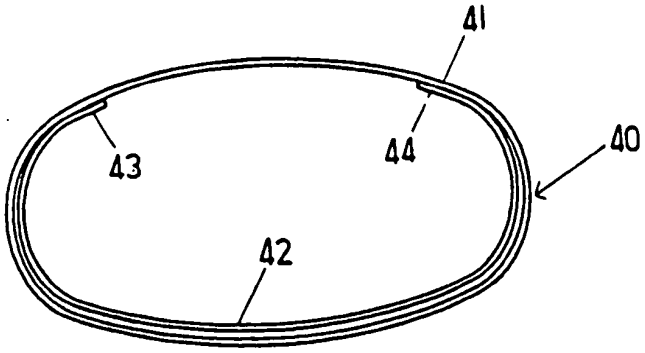

FIG. 7

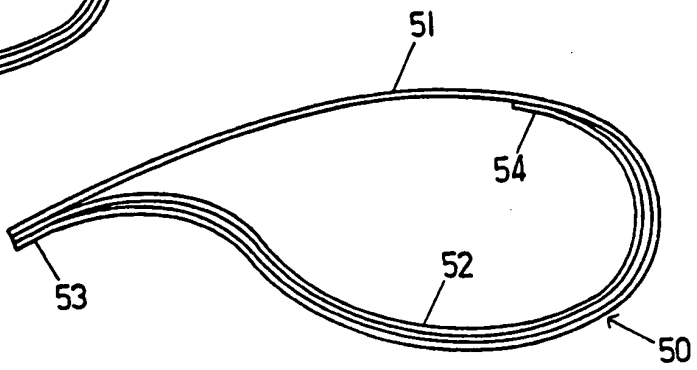

FIG. 8

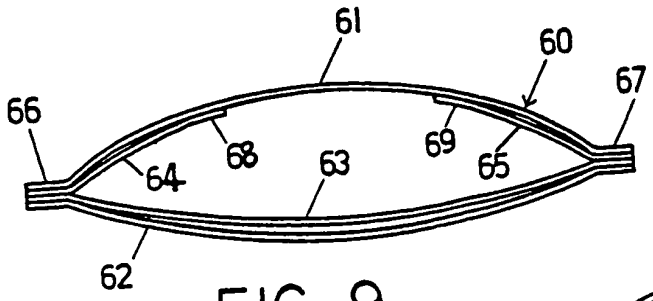

FIG. 9

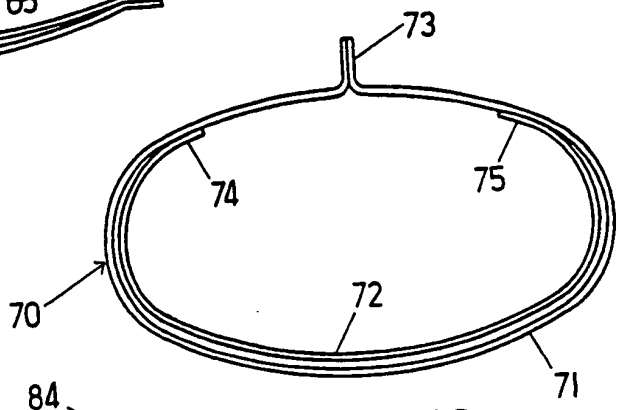

FIG. 10

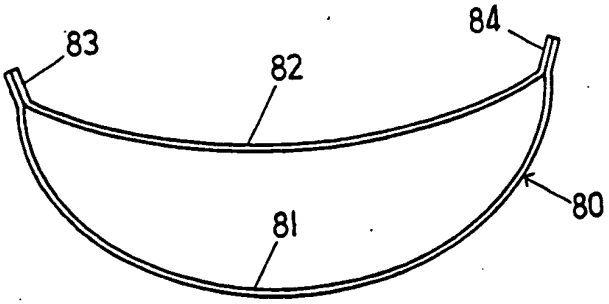

FIG. 11

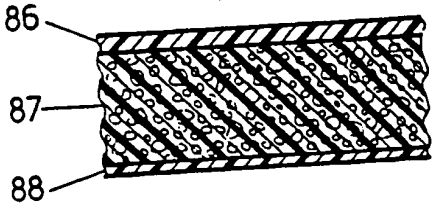

FIG. 12

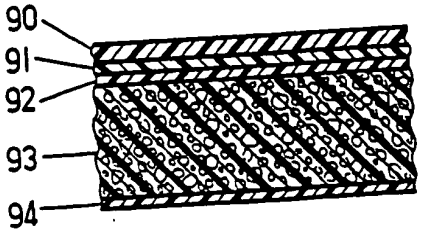

FIG. 13

SPECIFICATION

Improvements relating to heat-sealable bags

This invention pertains generally to heat sealable bags adapted for packaging foodstuffs, for instance, such as meats and similar products, and more particularly to bags which are adapted to be evacuated to draw the bag tightly around the product before the bag is sealed.

Cuts of meat for example are often packaged in plastics bags which are evacuated and heat sealed before delivery to the customer. Such packaging is particularly common with so called "primal" cuts of meat such as roasts and rib sections. Typically, such cuts of meat have substantial portions of bone remaining in them, and often the bones will protrude from the meat. Protruding bones can present a problem when evacuating the meat package, since sharp bones can puncture the walls of the bag.

A puncture of the bag wall will release the vacuum and allow air to enter the bag and migrate around the meat, resulting in deterioration of the meat and considerable leakage of the fluids contained in the bag with the meat. This problem has been minimized by utilizing a post sealing treatment which involves heating the sealed package to cause heat sealable inner surfaces of the bag walls to seal together where these walls have been drawn together during the evacuation process. A bag sealed in this manner is mechanically held tight to the meat and will not generally separate from the meat if a portion of the bag is punctured. However, there will be drainage of fluid from the meat package and localized introduction of air into the package which can damage the meat.

Various types of boneguard have been inserted into packaging of this nature. A conventional boneguard is a wax impregnated cloth or plastic insert which is placed by hand over the exposed bone before the meat is inserted in the package. These inserts do not seal to the inner surfaces of the outer bag. Additional boneguard structures include separate layers of plastic which are sealed into the bag to cover those areas which will be exposed to the protruding bones. These structures have suffered from various limitations, including relative high cost of labour and materials involved in placing the inserts properly into the bag, and locating the meat so that the bone abuts the insert. In addition, the inserts often have not adequately protected the bag from the effects of protruding bones, so that punctures are still possible.

According to one aspect of the present invention, there is provided a bag for use in packaging items having protrusions likely to pierce packaging, the bag being closed at a back end and open for insertion of an item at a front end thereof, and comprising (a) an outer skin of generally tubular form which has an inner surface layer of heat sealable thermoplastic material and an outer surface layer which is unaffected by temperatures needed to effect heat sealing of the thermoplastic layer, and (b) an inner, pierce-resisting protective panel having surfaces of heat-sealable thermoplastic material and side edges substantially equal in length to the length of the tubular skin, the protective panel being secured to the skin, so as to cover and protect a portion of the inner surface area thereof, by heat seals between its side edges and the thermoplastic inner layer of the skin and by a heat-sealed join between the protective panel and the skin across the closed back end of the bag, the said join forming the back end closure of the bag, all confronting surfaces of the skin and protective panel at the front end of the bag being heat sealable by applying heat and pressure thereto, for closing the bag after insertion of an item therein.

The invention also provides a bag for use in packaging items having protrusions likely to pierce packaging, the bag being closed at a back end and open at a front end for insertion of an item into the bag, and comprising an outer panel in the form of a tube having an inner layer of heat sealable thermoplastic material and an outer layer of plastics material which is not affected by temperatures required to seal the heat sealable material, and an inner rectangular protective panel having surfaces of heat sealable thermoplastic material, the inner panel having two parallel side edges substantially equal in length to the length of the tubular outer panel which are heat sealed to the inner surfaces of the tubular outer panel at spaced positions on the inner periphery thereof, the said outer and inner panels being folded together and heat sealed along back end edges thereof thereby closing the back end of the bag, all of the facing surfaces of the said inner and outer panels at the front open end of the bag being heat sealable so that the bag may be closed by bringing the front edges of the said panels together under heat and pressure.

One of the bag outer panels could serve the function of the inner protective panel, and hence the invention further provides a bag for use in packaging items having protrusions likely to pierce packaging, the bag being closed at one, back end and open at the opposite, front end for insertion of an item into the bag, the bag comprising a first rectangular bag panel having an inner layer of heat sealable thermoplastic material and an outer layer of plastics material not affected by temperatures required to seal the heat sealable material, and a second rectangular bag panel having two opposite side edges which are substantially equal in length to the corresponding side edges of the first panel, the second panel being a coextrusion of a first layer of heat sealable thermoplastic material, a second layer of foamed pierce-resisting heat sealable thermoplastic material, and a third layer of plastics material which is not affected by temperatures required to seal the heat sealable material, the first layer forming part of the inner surface of the bag, the two second panels having their inner surfaces heat sealed together along their side and back edges, and the facing surfaces of the first and second panels at the front of the bag are heat sealable so that the bag can be closed by bringing the front edges of the bag panels together under heat and pressure.

The inner protective panel, where such is provided as a panel separate from the outer panels, will be

secured at the back end of the bag to the latter panels. It will also be secured to them at the front of the bag after filling, when finally closing the bag. Being secured along two edges, it may be possible to omit securing the protective panel along its lateral sid edges. Accordingly, the invention further provides a bag for use in packaging items having protrusions likely to pierce packaging, the bag being closed at one, its back end and open at its opposite front end for insertion of an item into the bag, and the bag comprising first and second outer rectangular panels each having an inner layer of thermoplastic heat sealable material and an outer layer of a plastics material which is not affected by temperatures required to seal the heat sealable material, two opposite side edges of each outer panel being of the same length, and the two outer panels being heat s aled together along the side edges and back edges thereof, and an inner rectangular pierce-resistant protective panel having two opposite side edges substantially equal in length to the corresponding side edges of the outer panels, said inner protective panel being a coextrusion of a first layer of heat sealable plastics resin, an intermediate layer of foamed plastics resin, and an outer layer of heat sealable plastics resin, said inner protective panel being sealed to the two outer panels at least along its edge at the back end of the bag, and the facing surfaces of all the panels at the front of the bag are heat sealable to one another so that the bag may be closed by bringing the front edges of the panels together under heat and pressure.

Bags embodying the invention are well suited for the packaging of meat having bone protrusions. Preferred bags can include at least one generally rectangular outer panel and at least one smaller, generally rectangular inner panel which is heat sealed to the inner surfaces of the outer layer and provides protection against bone protrusions. The outer panel can be a coextrusion of an inner layer of thermoplastic heat sealable material, and an outer layer of plastics material which is not affected by heat sealing temperatures, such as nylon. The e.g. nylon outer layer also provides structural strength to the package and preferably acts also as a moisture and gas barrier. The inner panel is formed of a plastics material having outer surfaces which are heat sealable to allow sealing to the inner surfaces of the outer panel. The protective boneguard panel provides cushioning against any bones that may protrude from the meat being packaged.

In each of the preferred embodiments disclosed hereinafter, the inner boneguard panel is sealed to inner surfaces of the outer panel or panels at at least two side heat seals which run the length of the package, and along a back edge heat seal which closes the back end of the bag. The bag is so constructed that after insertion of a meat product into the bag, the front edges f the bag may be sealed together by pressing the front edges of the bag together under heat and pressure. All facing surfaces of the inner and outer panels at the front edge of the bag are formed of heat sealable material and will seal well t gether when heat sealing bars are applied to the outside surfaces of the package.

The inner protective or boneguard panel may comprise a multi-layer coextruded laminate which has outer layers composed of heat sealable plastics resin and a core layer of plastics resin which has been foamed to give it greater thickness and enhanced cusioning effect. It has been found that the foamed layer greatly reduces the likelihood of a bone puncturing the boneguard panel, since the cushioning effect of the foam tends to spread any strain applied by a sharp piece of bone over a small area of the boneguard.

All inner surfaces of the bag are heat sealable so that the bag is well adapted to a bag heating process after evacuation and sealing of the bag so as to firmly seal together adjoining surfaces of the bag which have been drawn together during evacuation of the bag.

The protective panel desirably covers or foams at least 50% of the bag interior surface, e.g. 60% or more.

The tubular outer skin can take a variety of forms e.g. a seamless tube or a seamed tube produced from one, two or conceivably more outer panels seamed-together along adjoining lateral side edges thereof.

Preferred embodiments of the invention are now described in more detail by way of example only with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a meat packaging bag in accordance with the invention showing an open front end thereof,

Figure 2 is a cross-sectional view of a meat package in accordance with the invention, with a meat product inserted in a bag and the resulting package having been evacuated and sealed.

Figure 3 is an enlarged view looking at the open front end of the bag shown in Figure 1, with portions of the bag being broken away to show only essential features thereof.

Figure 4 is a view similar to Figure 3 of another embodiment of the invention,

Figure 5 is a cross-sectional view of a portion of back edge heat sealed layers of the bag of Figure 1,

Figure 6 is a cross-sectional view of the layers of the bag of Figure 1 as taken through a side heat seal, with the layers being spaced slightly apart to show the various layers more clearly in the illustration,

Figure 7 is a front end view of another embodiment of a bag in accordance with the invention wherein an outer panel of the bag is formed as a continuous tube,

Figure 8 is a front end view of another embodiment of a bag according to the invention, which includes a single rectangular outer panel,

Figure 9 is a front end view of a further embodiment of the invention in which there are two outer panels and three inner b neguard panels,

Figure 10 is a fr nt end view of still another embodiment of a bag according to the invention, which employs a single rectangular outer panel,

Figure 11 is a front end view of a still further embodiment of a bag according to the invention, wherein one of tw panels forming the bag incorporates a unitary multi-layer boneguard structure,

Figure 12 is a cr ss-sectional view of the boneguard panel of the bag of Figure 11, and

Figure 13 is a cr ss-sectional view of an alternative construction for the boneguard panel of the bag shown in Figure 11.

One pref rred embodiment of a heat sealable meat packaging bag in accordance with the invention is shown generally at 10 in Figure 1. The major structural layers of the bag are shown (for convenience of illustration) in somewhat exaggerated thickness in Figure 1, and include a generally rectangular outer protective panel 11, a second rectangular outer panel 12, and an inner rectangular boneguard protective panel 13. The bag shown in Figure 1 is open at its front (the left end as illustrated) so as to allow insertion of a meat product therein. The three panels forming the bag are heat sealed together along their opposite side edges at lateral edge heat seals 14 and 15, and along their back edges at a heat seal 16.

In use, a meat product is inserted into the open front of the bag 10, the bag is evacuated, and the front edges 17, 18 and 19 of the layers 11, 12 and 13 are pressed together to seal the evacuated bag tightly about the meat product. A cross-sectional view through a packaged meat product is shown in Figure 2, wherein the bag is illustrated tightly drawn about a meat product 20. As illustrated by Figure 2, the act of evacuating the inside of the bag draws the bag tightly against all of the surfaces of the meat product. The bag will thus be in contact with any protruding bones on the product. In developing this invention, we have now recognized that many meat products have protruding bones which extend over greater than 50% of the surface of the meat product, or that the protruding bones are spaced apart in a manner so as to require a protective layer which encompasses more than 50% of the surface of the product. The bag 10 is so designed to provide protection against protruding bones in meat packages having this characteristic. Thus, the generally rectangular second outer panel 12 and the inner boneguard protective panel 13, which are substantially the same size and shape, are larger than the first outer panel 11. A preferred ratio is 60% of the surface area covered by the second outer panel 12 and 40% by the first outer panel 11. It is not necessary that the boneguard protective panel 13 extend entirely around the periphery of the bag, since bone protrusions will not cover the entire surface of the product, but tend to be localised to one side of a cut. It is desirable to cover less than the entire surface area of the bag with the boneguard since the boneguard panel may tend to obscure sight of the meat product inside. Moreover, since it is not necessary to have a boneguard layer around the entire periphery of the bag, to do so would add additional cost to the bag structure without pr viding additional advantage.

In order to obtain the bag structure shown in Figure 1, the two parallel side edges of the first outer panel 11 must be substantially equal in length to the two parallel side edges of the second outer panel 12, as well as to the two parallel side edges of the inner boneguard panel 13. These equal length side edges are seal d together at the lateral edge seals 14 and 15. In order for more than one half of the bag surface to be covered by the boneguard 13, the remaining two parallel edges of the boneguard panel 13 and the second outer panel 12, i.e. their front and back edges, must be substantially longer than the corresponding parallel edges of the first outer panel 11. After formation of the lateral heat seals 14 and 15, the back edge heat seal 16 is formed by pressing the back edges of each of the panels 11, 12 and 13 together under heat and pressure.

The lateral edge seals 14 and 15 are shown in the partial front view of Figure 3. In this Figure, the thicknesses of the panels have been exaggerated for clarity of illustration. In order to provide the heat seals 14 and 15, the inner surfaces of the outer panels 11 and 12 must be heat sealable with or to the surfaces of the boneguard panel 13, since these respective surfaces will be facing one another at the time that the heat seals are made. The outer surfaces of the panels 11 and 12 are formed of a plastics material which is not affected by the temperatures required to make the heat seals.

Over the remainder of the bag surface, the outer panel 12 and the boneguard panel 13 are not sealed to one another. Thus, when suction is applied to the open front end of the bag 10, air between the panels 12 and 13 can be drawn out thus avoiding trapping pockets of air between these panels.

The back heat seal area 16 is shown in Figure 5, which particularly shows a partial cross section to an exaggerated scale through the portion of the heat seal 16 which includes the lateral edge seal 15. Since the panels 12 and 13 are larger than the other panel 11, when the front edges of all three panels are aligned, the back edges of panels 12, 13 project rearwardly beyond the back edge of smaller panel 11. The back edges of the panels 12, 13 are folded over the back edge of panel 11 when producing a sealed back end closure of the bag 10. As shown here, a portion of the boneguard panel 13 is folded over at the edge of the bag and sealed to itself before terminating at the lateral side edge at which it meets and is sealed to the first outer panel 11. The second outer panel is similarly folded over and sealed at the heat seal area 16. The heat and pressure applied at the seal area 16 causes the second outer panel 12 to be sealed to the boneguard panel 13 at all areas along the first heat seal at which they adjoin. In addition, the first outer panel 11 is sealed to the boneguard panel 13 at all areas along the heat seal 16 at which these panels adjoin. Thus, it will be observed that all surfaces which define the interior, or back end of the bag 10 are heat sealed together to form an air tight seal.

The structure of the back heat seal 16 in the area of the lateral edge seal 14 is a mirror image of the structure shown in Figure 5.

An alternative bag construction which utilizes only a single outer panel is shown in front view in Figure 4. The construction of the bag 21 is substantially identical to that of the bag 10 just described except that a single rectangular outer panel 22 extends around one of the equal length side edges of the rectangular boneguard panel 23 at one of the heat seals 24. The outer panel 22 extends to the other

heat seal 25 at which area it seals the other side edge of the boneguard panel 23 between the side edges of the outer panel 22. Outer panel 22 serves as both panels 11 and 12 of the bag 10 shown in Figure 1.

Again, it is preferred that the boneguard panel 23 should cover less than the total surface area of the bag but more than 50% of the surface area. This is accomplished by locating the first heat seal 24 at a position less than half-way around the periphery of the bag from the heat seal 25. The lengths of the outer panel 22 and of the boneguard panel 23 (and of the bag from front to back) are substantially equal in length, while the front and back edges of the outer panel extend for the entire periphery of the bag while the front and back edges of the boneguard panel are substantially shorter. A portion of the outer panel 22 is folded over one of the side edges of the boneguard panel 23 such that the inner surfaces of the outer panel adjoin the opposed surfaces of the boneguard panel in the vicinity of the heat seal 24. These respective surfaces are formed of heat sealable material such that when heat sealer clamps apply heat and pressure to the seal area 24, an hermetic seal will be formed.

The back edge heat seal (not shown) is substantially the same as the heat seal 16 of the bag 10. The seal 25 is identical to seal 15 shown in Figure 5 and the back edge seal at the location of the heat seal 24 is virtually identical to that shown in Figure 5 except that the outer panel 22 extends around the boneguard panel. Otherwise, the back edge seals between respective inner surfaces for the bag 21 are identical to those for the bag 10.

Various materials are suitable for forming the bags 10 and 21. Generally, layers that form the outer surfaces of the outer panels 11, 12 and 22 must be able to withstand the temperatures applied externally to form heat seals at the inner surfaces of these materials without melting. Typical materials able to meet this requirement are nylon and polyesters. However, since these materials do not form good heat seals, it is necessary to laminate thereto an inner, heat sealable layer of a material which will adhere well to the protective outer layer. For example, a material such as ionomer, such as is sold under the name Surlyn, is suitable for coextruding with a nylon outer layer. The ionomer layer has the capacity of forming good heat seals at moderate heat sealing temperatures, and is also adapted to provide good seals to itself during post heating treatment after the bag has been evacuated and the front edges have been sealed together.

The inner boneguard panels 13 and 23 may comprise a solid heat sealable plastics film such as ionomer or a variety of other plastics, or they may be formed as a multilayer laminate. If a laminate is utilized, its outer surfaces must be capable of forming good heat seals. It is preferred that the surfaces of the inner panels be compatible in heat sealing characteristics with the inner surfaces of the outer pansls so that seals are formed between these surfaces during the post heat treatment. Thus, the materials of these respective surfaces should soften sufficiently to form heat seals at similar temperatures.

An alternative multi-layer boneguard panel structure is shown in Figure 6, which is a cross sectional view through the heat seal area 15 with the various layers of the package being shown slightly separated for clarity. The first outer panel 11 has an outer layer 31 of plastics material which is not affected by heat sealing temperatures and an inner layer 32 of heat sealable thermoplastic material. Similarly, the second outer panel 12 has an outer protective layer 34 of plastics material not affected by heat sealing temperatures and an inner heat sealable thermoplastic layer 35. As indicated above, examples of materials of which the outer protective layers can be formed include nylon and polyester, whereas the inner layers may be formed of such materials as ionomer, ethylene vinyl acetate and other materials adapted to adhere to the outer layers. Typical thicknesses for the outer layer are in the range of 1/2 to 1 thou. (12 to 25 microns) and the inner heat sealable layers 32 and 35 would be of similar dimensions. The boneguard panel 13 is formed of two separate coextruded multi-layer structures, which are thereafter pressed together. Each of the multi-layer structures include a central, relatively thick core layer of foamed thermoplastic material 37 and outer layers of heat sealable plastics film 38 and 39. The double multi-layer construction may be formed easily by blown-film coextrusion of the outer heat sealable layers about an inner core of foamed material into the typical tube formed by blown coextrusion, followed by collapsing the tube to press the walls of the tube together to form the double layer construction 13 shown in Figure 6.

We have discovered that highly desirable bone cushioning characteristics are obtained by a multi-layer sandwich structure, such as that shown in Figure 6, which includes a central core of foamed plastics material between layers of heat sealable thermoplastic with which the foamed layer is coextruded. Examples of materials of which such structures have been constructed include ionomer (metal salt neutralized polymer obtained from DuPont Corporation under the name Surlyn), ethylene vinyl acetate and combinations thereof. For example, the layers 37, 38 and 39 have been formed as a blown film coextrusion of a 12 thou. thick layer of ionomer foam between 1/2 to 1 thou. thick layers of ionomer, and a 12 thou. thick ethylene vinyl acetate foam between an outer layer of ionomer and an inner layer of ethylene vinyl acetate each 1/2 to 1 thou. thick. Foaming of the core material was obtained by incorporating, at a level 7% to 14% by weight of the core, a foaming agent consisting essentially of 90% low density polyethylene carrier and 10% azodicarbonamide as a blowing agent, which is obtained from the Ampacet Corporation as Ampacet 10104. Ionomer is a preferred outer layer since it will adhere well to itself and to the adjoining surfaces of the outer panels 11, 12 during the post-sealing heat treatment process.

A single coextrusion of layers 37, 38 and 39 may be utilized as the boneguard layer, in which case the foam layer 37 would preferably be 20 to 30 mils thick.

Modified bags in accordance with the present

invention are shown in Figures 7 to 11.

In Figure 7, a meat packaging bag 40 is shown in front elevation, the bag 40 including a continuous tubular outer panel 41 and an inner boneguard panel 42 whose side edges are heat sealed to the inner surface of the tubular outer panel at heat seals 43 and 44. These side edges are equal in length to the length of the outer tube and the heat seals 43 and 44 run their length. The outer panel 41 is a tubular blown coextrusion of the type described above for the layers 11 and 12 of the bag 10, and has an inner surface layer formed of a layer of heat sealable thermoplastic material and a heat resistant outer surface layer. The rectangular boneguard panel 42 is formed as described above for the boneguard layer 13 and has surfaces composed of a heat sealable thermoplastic material. As is apparent from the view of Figure 7, the facing inner surfaces of the panels forming the bag are heat sealable so that the ends can be easily heat sealed by pressing them between heat sealer bars under heat and pressure. The facing back edges of the panels are heat sealed together (not shown) to form the completed bag, which is open at one, the front, end.

Another bag 50 in accordance with the invention is shown in Figure 8. The bag 50 is formed of a single rectangular outer panel 51 and an inner rectangular boneguard panel 52 which has one side edge retained between the two side edges of the outer panel 51 in a heat seal 53. The other side edge of the boneguard panel 52 is sealed by a heat seal 54 to the inner surface of the outer layer 51 at a position intermediate the side edges of the outer panel. The side edges of the inner panel are equal in length to the side edges of the outer panel, while the front and back edges of the inner are substantially shorter than the front and back edges of the outer panel. The back edge of the inner panel is heat sealed along the folded over back edge thereof, with the remainder of the folded over back edge being heat sealed to itself. The structure of the outer panel 51 can be formed as described above for the outer panel 11 and the boneguard panel 52 can be formed as described above for the boneguard panel 13. Again, all facing inner surfaces of the various layers are heat sealable so that the open end of the bag can be heat sealed after the meat product has been inserted into the bag.

Another bag 60 in accordance with the invention, which has more than 50% of its surface are covered by a boneguard panel, is shown in Figure 9. The bag 60 includes a first rectangular outer panel 61, a second rectangular panel 62, a first rectangular inner boneguard panel 63, and a pair of smaller rectangular inner boneguard panels 64 and 65. All of the panels have front, back and side edges, of which all of the side edges are of equal length. Lateral sid edges of panels 61, 62 and 63 are heat sealed together with uter side edges f the smaller panels 64 and 65 at heat seals 66 and 67. In addition, the inner side edges of the smaller boneguard panels 64 and 65 are sealed by heat seals 68, 69 to the inner surface of the upper uter panel 61 which they confront. The outer panels 61 and 62 are f rmed as described above for the outer panel 11, and the boneguard panels 63, 64 and 65 are formed as described above for the boneguard panel 13. All facing surfaces at the back edges of the respective panels are heat sealed together.

Another bag 70 according to the invention is shown in Figure 10. The bag 70 includes a single rectangular outer panel 71 which has the inner surfaces of two opp site side edges thereof sealed together along a heat seal 73 which runs the length of the bag, panel 71 thus taking the form a fin-sealed tube. A single rectangular inner boneguard panel 72 is sealed to the inner surface of the outer panel 71 along heat seals 74 and 75 spaced on either side of the heat seal 73. The length of the front and back edges of the inner boneguard panel 72 is preferably selected to be somewhat greater than half of the length of the front and back edges of the outer panel 71 so that the boneguard covers more than 50% of the surface area of the bag. The structure of the outer panel 71 corresponds to the structure described above for the outer panel 11, and the structure of the boneguard panel 72 corresponds to that of the boneguard panel 13. All facing surfaces at the back edges of the two panels are heat sealed together.

Another bag 80 in accordance with the invention is shown in Figure 11. The bag 80 consists of two rectangular panels 81 and 82, the former also acting as a boneguard panel. The panels 81 and 82 have the inner surfaces along their side edges sealed together by heat seals 83 and 84. Each of the panels has side edges equal in length. It is preferred that the length of the front and back edges of the boneguard panel 81 be greater than that of the other panel 82 so that the boneguard panel covers more than 50% of the surface area of the bag.

The shorter or narrower outer panel 82 is preferably formed with a structure similar to that of the outer panel 11 of the bag 10. The boneguard outer panel 81, however, incorporates a multi-layer construction which provides good boneguard protective qualities. A first example of such a construction is shown in Figure 12 and comprises layer 86 which is not affected by heat sealing temperatures, a core layer 87 of foamed plastic, and heat sealable thermoplastic layer 88, the latter of course, facing inwardly in the bag 80. For example, nylon in a thickness of 1 to 2 thou. may be utilized for the layer 86, foamed ionomer in a thickness range of 20 to 30 thou. may be utilized for the intermediate or core layer 87, and the heat sealable layer 88 may be formed of ionomer in a thickness of 1/2 to 2 thou. Ionomer is a preferred material for contact with nylon in coextrusions because of its ability to adhere to the nylon layer.

An alternative construction for the boneguard panel 81 is shown in Figure 13. The construction includes protective layer 90 of material not affected by heat sealing temperatures, two intermediate layers 91 and 92, a central core layer 93 of foamed plastics, and layer 94 of heat sealable thermoplastic material, layer 94 again facing inwardly in the bag 80 featuring this construction. The preferred thicknesses for the layers 90, 91, 92 and 94 would be in the range of 1/2 to 2 thou, whereas the foamed core layer 93 would have a thickness of 20 to 30 thou. A suitable material for the three layers 92, 93 and 94 is

ionomer, and the intermediate layer 34 may be formed f a material which has good adhesion to both nylon and ionomer, such as a polyolefin modified by the addition thereto of functi nal groups e.g. sold under the name "Plexar" by the Chemplex Company and as disclosed in U.S. patents Nos. 4,087,587 and 4,087,588.

In both f the boneguard structures shown in Figures 12 and 13, the outer layer incorporates a single unitary multi-layer structure both the relatively strong containment structure provided by the nylon layer and the cushioning effect provided by the intermediate core layer 87 of foamed plastic. It is seen that the inner surfaces of the boneguard structures shown in Figures 12 and 13 both include layers of material which are heat sealable.

In all of the embodiments described above, all facing surfaces of the various panels at the front of the bag are heat sealable. Thus, the bag can be closed by bringing the front edges of the bag panels together under heat and pressure after the product has been inserted.

It is to be understood that the invention is not confined to the particular construction and arrangement of parts herein illustrated and described, but embraces all such modified novel forms thereof as come within the scope of the appended claims.

The bags disclosed above need not be used exclusively with meat products, and hence can be useful for packaging fish whose bones, of course, are quite sharp and liable to puncture a conventional plastics bag. The bags could, equally, be used for safely packaging non-commestible items, e.g. items of ironmongery, tools and so on.

CLAIMS

1. A bag for use in packaging items having protrusions likely to pierce packaging, the bag being closed at a bag end and open for insertion of an item at a front end thereof, and comprising (a) an outer skin of generally tubular form which has an inner surface layer of heat sealable thermoplastic material and an outer surface layer which is unaffected by temperatures needed to effect heat sealing of the thermoplastic layer, and (b) an inner, pierce-resisting protective panel having surfaces of heat-sealable thermoplastic material and side edges substantially equal in length to the length of the tubular skin, the protective panel being secured to the skin, so as to cover and protect a portion of the inner surface area thereof, by heat seals between its side edges and the thermoplastic inner layer of the skin and by a heat-sealed join between the protective panel and the skin across the closed back end of the bag, the said join forming the back end closure of the bag, all confr nting surfaces of the skin and protective panel at the front end of the bag being heat sealable by applying heat and pressure thereto, for closing the bag after insertion of an item therein.

2. A bag according to claim 1, wherein the pr tective panel is dimensional so as t cover at least 50% of the inner surface area of the bag.

3. A bag according to claim 1 or claim 2, wherein the protective panel is rectangular.

4. A bag according to claims 1, 2 or 3, wherein the heat-sealed join comprises folded ver layers of the skin and the pr tective panel.

5. A bag according to claims 1, 2, 3, or 4 wherein the outer skin comprises two rectangular panels seamed together to produce a tubular form, each having front, back and side edges with the side edges of th panels being equal in length, th front and back edges f one of the panels being substantially longer than the corresponding edges of the other panel, each skin panel being formed of an inner layer of a thermoplastic heat sealable material and an outer plastics material layer which is not affected by heat sealing temperatures, the inner protective panel having front, back and side edges which are substantially equal in length to corresponding edges of the larger skin panel, and the said inner panel being secured along its side edges and along its back edge between the two skin panels by heat seals formed along the side edges of the skin panels and along the entire length of the back edge of the smaller skin panel, portions of the back edges of the larger skin panel and of the inner panel extending outwardly from the back edge of the smaller skin panel being folded over and heat sealed together, facing surfaces of all three panels at the open front end of the bag being heat sealable together so that the bag may be closed by pressing the front edges of the bag panels together under heat and pressure.

6. A bag according to any of claims 1 to 4, wherein the outer skin is formed from one rectangular panel having front, back, and side edges, the side edges being heat sealed one to the other to produce a tubular form, the inner protective panel having front, back, and side edges its side edges being substantially equal in length to the side edges of the said rectangular skin panel while its front and back edges are substantially shorter than the front and back edges of the said skin panel, one of the side edges of the inner panel being secured in the heat seal between the side edges of the skin panel the other inner panel side edge being secured and heat sealed in a fold formed along the length of the skin panel from its front edge to its back edge, and the back edge of the skin being secured and heat sealed to the back edge of the skin panel to produce the bag rear end closing join.

7. A bag according to claim 6, wherein the back ends of the skin and protective panels have a folded and heat sealed configuration closing the back end of the bag.

8. A bag according to claim 6 or claim 7, wherein the length of the front and back edges of the inner panel is substantially greater than one half of the length of the front and back edges of the skin panel, whereby more than 50% of the surface area of the resulting bag is covered by the protective inner panel.

9. A bag according to any of claims 1 t 4, wherein the outer skin is formed from one rectangular panel having front, back and side edges, the side edges being heat sealed one to the other to produce a tubular form, the inner protective panel having front, back and side edges, its side edges being

substantially equal in length of the side edges of the skin panel while its front and back edges are substantially shorter than the front and back edges of the skin panel, one of the side edges of said inner panel being secured in the heat seal between the side edges of the skin panel, the other of the side edges being heat sealed to the inner surface of the skin panel at a position intermediate the side edges thereof, and the back edge of the inner panel being heat sealed between the heat sealable inner surfaces of the skin panel along a folded over back edge thereof, the remainder of the folded-over back edge of the skin panel which extends laterally beyond the back edge of the inner panel being heat sealed to itself.

10. A bag according to any of claims 1 to 4, wherein the outer skin is formed from one outer rectangular panel having front, back and side edges with the side edges heat sealed to one another to produce a tubular form, the protective inner panel having front, back and side edges, its side edges being substantially equal in length to the side edges of the skin panel while its front and back edges are substantially shorter than the front and back edges of the skin panel, the side edges of the inner panel being heat sealed to the inside surface of the skin panel at positions spaced on either side of the seal between the side edges of the skin panel, the skin and inner panels being heat sealed together along folded over back edges thereby forming a closed rear end of the bag.

11. A bag for use in packaging items having protrusions likely to pierce packaging, the bag being closed at a back end and open at a front end for insertion of a item into the bag, and comprising an outer panel in the form of a tube having an inner layer of heat sealable thermoplastic material and an outer layer of plastics material which is not affected by temperatures required to seal the heat sealable material, and an inner rectangular protective panel having surfaces of heat sealable thermoplastic material, the inner panel having two parallel side edges substantially equal in length to the length of the tubular outer panel which are heat sealed to the inner surfaces of the tubular outer panel at spaced positions on the inner periphery thereof, the said outer and inner panels being folded together and heat sealed along back end edges thereof thereby closing the back end of the bag, all of the facing surfaces of the said inner and outer panels at the front open end of the bag being heat sealable so that the bag may be closed by bringing the front edges of the said panels together under heat and pressure.

12. A bag according to claim 11, wherein the protective inner panel extends around more than 50% of the periphery of the tubular outer panel.

13. A bag according to any of claims 1 to 4, wherein the outer skin comprises two rectangular panels seamed together by heat seals along two corresponding side edges thereof to produce the tubular form, and an inner pierce-resisting means comprising a plurality of inner protective panels, said inner panels including a first rectangular inner panel having front, back and side edges which are substantially equal in length to the corresponding edges of at least one of the outer panels and having surfaces of heat sealable thermoplastic material, and a pair of smaller rectangular inner panels which have surfaces of heat sealable thermoplastic material and are each narrower than the first inner panel, side edges of each of the smaller inner panels being substantially equal in length to the side edges of the outer panels and of the first inner panel, each side edge of the first inner panel and one side edge of each of the smaller inner panels being heat sealed between the heat sealable surfaces of outer panels at a respective one of the two seams between the side edges of the outer panels, the other side edges of the smaller inner panels being heat sealed to the inner surface of one outer panel which they face.

14. A bag according to claim 13, wherein the larger, first protective inner panel covers the entire inner surface of one of the outer panels and the two smaller protective inner panels together cover only a portion of the inner surface of the other outer panel.

15. A bag according to claim 14, wherein the said covered portion of the other outer panel is a major part of the inner surface area of the said other outer panel.

16. A bag for use in packaging items having protrusions likely to pierce packaging, the bag being closed at one, back end and open at the opposite, front end for insertion of an item into the bag, the bag comprising a first rectangular bag panel having an inner layer of heat sealable thermoplastic material and an outer layer of plastics material not affected by temperatures required to seal the heat sealable material, and a second rectangular bag panel having two opposite side edges which are substantially equal in length to the corresponding side edges of the first panel, the second panel being a coextrusion of a first layer of heat sealable thermoplastic material, a second layer of foamed pierce-resisting heat sealable thermoplastic material, and a third layer of plastics material which is not affected by temperatures required to seal the heat sealable material, the first layer forming part of the inner surface of the bag, the two second panels having their inner surfaces heat sealed together along their side and back edges, and the facing surfaces of the first and second panels at the front of the bag are heat sealable so that the bag can be closed by bringing the front edges of the bag panels together under heat and pressure.

17. A bag according to claim 16, wherein the front and back edges of said second panel are substantially longer than the corresponding edges of the first panel, and the back edges of the two panels are heat sealed together such that portions of the second bag panel are folded over and sealed together along the back edge, more than 50% of the bag surface being provided by the second panel.

18. A bag according to any of claims 1 to 15, wherein the or each inner protective panel is a co xtrusion of a first layer of heat sealable plastics resin, an intermediate layer of foamed plastics resin, and an outer layer of heat sealable plastics resin.

19. A bag according to any of claims 1 to 15, wherein the or each inner protective panel is a laminate composed of identical coextrusions each